

Customer No.: 31561
Docket No.: 12009-US-PA
Application No.: 10/605,782

In The Claim

Claim 1 (currently amended) A method for forming a nitrided tunnel oxide layer, comprising:

forming a silicon oxide layer as a tunnel oxide layer on a semiconductor substrate;

performing a plasma nitridation process to implant introduce nitrogen atoms into the silicon oxide layer; and

performing a thermal drive-in process to diffuse the implanted introduced nitrogen atoms across the silicon oxide layer.

Claim 2 (Original) The method of claim 1, wherein forming the silicon oxide layer comprises performing an in-situ steam generation (ISSG) process.

Claim 3 (Original) The method of claim 1, wherein the plasma nitridation process utilizes N₂ plasma.

Claim 4 (Original) The method of claim 1, wherein the plasma nitridation process is conducted under a temperature lower than 400°C.

Claim 5 (Original) The method of claim 1, wherein the thermal drive-in process comprises a furnace annealing process or a rapid thermal annealing process.

Claim 6 (Original) The method of claim 5, wherein the thermal drive-in process is conducted under 850 to 1100°C for 30 seconds to 1 hour.

Claim 7 (New) A method for forming a nitrided tunnel oxide layer, comprising:

forming a silicon oxide layer as a tunnel oxide layer on a semiconductor substrate;

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performing a plasma nitridation process to introduce nitrogen atoms into a surface of the silicon oxide layer; and

performing a thermal drive-in process to diffuse the introduced nitrogen atoms in the surface across the silicon oxide layer.

Claim 8 (New) The method of claim 7, wherein forming the silicon oxide layer comprises performing an in-situ steam generation (ISSG) process.

Claim 9 (New) The method of claim 7, wherein the plasma nitridation process utilizes N₂ plasma.

Claim 10 (New) The method of claim 7, wherein the plasma nitridation process is conducted under a temperature lower than 400°C.

Claim 11 (New) The method of claim 7, wherein the thermal drive-in process comprises a furnace annealing process or a rapid thermal annealing process.

Claim 12 (New) The method of claim 11, wherein the thermal drive-in process is conducted under 850 to 1100°C for 30 seconds to 1 hour.

Claim 13 (New) A method for forming a nitrided tunnel oxide layer, comprising:
performing an in-situ steam generation (ISSG) process to form a silicon oxide layer as a tunnel oxide layer on a semiconductor substrate;
performing a N₂ plasma nitridation process to introduce nitrogen atoms into the silicon oxide layer; and

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performing a thermal drive-in process to diffuse the introduced nitrogen atoms across the silicon oxide layer.

Claim 14 (New) The method of claim 13, wherein the N₂ plasma nitridation process is conducted under a temperature lower than 400°C.

Claim 15 (New) The method of claim 13, wherein the thermal drive-in process comprises a furnace annealing process or a rapid thermal annealing process.

Claim 16 (New) The method of claim 15, wherein the thermal drive-in process is conducted under 850 to 1100°C for 30 seconds to 1 hour.